PATENT ABSTRACTS OF JAPAN

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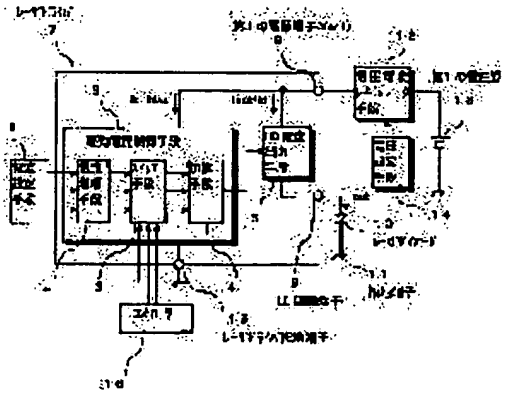
(54) OPTICAL DISK DEVICE



(57)Abstract:
PROBLEM TO BE SOLVED: To reduce unnecessary power consumption and heat generation by making the output voltage variable that is connected to the power terminal of a current to be supplied to a laser diode(LD).
SOLUTION: A power supply voltage is supplied from a first power terminal 8, for a driving current control means 6 and an LD current output means 5. The power supply voltage of the entire laser driver 7 is adjusted by a voltage setting means 14 so that both-terminal voltage of the LD current output means 5 becomes a prescribed value (about 1.2 V) in accordance with a forward voltage VF of the LD 10. By setting both-terminal voltage of the LD current output means 5 at the absolute minimum voltage for its operation, its power consumption (product of driving current and both-terminal voltage) by the driving current of the LD 10 can be controlled to the minimum. In addition, since the power consumption of the LD current output means 5

can be reduced, its heat generation can also be reduced.

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CLAIMS **Refer to the CORRECTION or AMENDMENT**

[Claim(s)]

[Claim 1] The optical disk unit characterized by having connected with this 1st power terminal, for output voltage having established the voltage adjustable regulator means in which adjustable is possible, and an output terminal making possible adjustable [of the supply voltage of this laser diode current-output means] in the optical disk unit which has a laser diode current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the current proportional to the input signal to laser diode through LD drive terminal.

[Claim 2] The optical disk unit with which an output terminal is connected to this 1st power terminal, and output voltage is characterized by to have established an output voltage setting means set up the output voltage of the voltage adjustable regulator means in which adjustable is possible, and this voltage adjustable regulator means, and to make possible adjustable [of the supply voltage of this laser diode current-output means] in the optical disk unit which has a laser diode current-output means a current supply source is carried out through the 1st power terminal, and supply the current proportional to the input signal to laser diode through a laser diode drive terminal.
[Claim 3] The optical disk unit according to claim 2 characterized by forming the controller which controls this voltage setting means so that the detection result of a difference-voltage-detector means and this difference-voltage-detector means which detects the difference voltage of the voltage of this 1st power terminal and the voltage of this laser diode drive terminal is incorporated and the aforementioned difference voltage serves as a predetermined value.
[Claim 4] In the optical disk unit which has a laser diode current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the current proportional to the input signal to laser diode through a laser diode drive terminal A difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal, and the voltage of this laser diode drive terminal, The optical disk unit characterized by establishing a difference voltage fixed-ized means to carry out adjustable [of the output voltage] and to supply this 1st power terminal so that difference voltage which this difference-voltage-detector means detected may be made into a control-input signal and difference voltage may be in agreement with internal-reference voltage.
[Claim 5] In the optical disk unit which carries the laser driver IC which builds in a laser diode current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the current proportional to the input signal to laser diode through a laser diode drive terminal, and this A difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal, and the voltage of this laser diode drive terminal, A triangular-wave generating means to output the triangular wave which makes internal-reference voltage Vref bias voltage, and changes up and down, The optical disk unit which carried the laser driver IC characterized by building at least one means in this laser driver IC among the comparators which compare with the output voltage of this triangular-wave generating means the difference voltage which this difference voltage-output means detected, and this laser driver IC.
[Claim 6] In the optical disk unit which carries the laser driver IC which builds in a laser diode current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the current proportional to the input signal to laser diode through a laser diode drive terminal, and this The difference-voltage-detector means and the internal-reference voltage Vref which detect the difference voltage of the voltage of this 1st power terminal and the voltage of this laser diode drive terminal are made into bias voltage. The triangular wave which changes up and down The optical disk unit which carried the laser driver IC characterized by building the comparator which compares with the output voltage of this triangular-wave generating means the difference voltage which a triangular-wave generating means to output, and this difference voltage-output means detected in this laser driver IC, and this laser driver IC.

[Claim 7] The optical disk unit characterized by to prepare the 1st voltage source which supplies the 1st supply voltage to this 1st power terminal, and the 2nd voltage source which supplies the 2nd supply voltage to these drive current control means in the optical disk unit which has the drive current control means which generate the signal wave form inputted into the laser diode current-output means and this laser diode current-output means a current supply source is carried out through the 1st power terminal, and supply the current proportional to the input signal to a laser diode through a laser diode drive terminal.
[Claim 8] Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and a laser diode drive terminal is minded. In the laser driver IC which builds in the drive current control means which generate the signal wave form inputted into the laser diode current-output means and this laser diode current-output means of supplying a laser diode The optical disk unit which carried the laser driver IC characterized by preparing the 1st power terminal which supplies the 1st supply voltage to this laser diode current-output means, and the 2nd power terminal which supplies the 2nd supply voltage to these drive current control means, and this.
[Claim 9] Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and a laser diode drive terminal is minded. In the laser driver IC which builds in the drive current control means which generate the signal wave form inputted into the laser diode current-output means and this laser diode current-output means of supplying a laser diode The optical disk unit which carried the laser driver IC characterized by preparing the 1st power terminal which supplies the 1st supply voltage to this laser diode current-output means, and the 2nd power terminal which supplies the 2nd supply voltage to built-in circuits other than this laser diode current-output means, and this.
[Claim 10] The claim 8 characterized by output voltage supplying the output voltage of the voltage adjustable regulator means in which adjustable is possible to this 1st power terminal, the optical disk unit of nine publications.
[Claim 11] The claim 8 characterized by establishing an output voltage setting means by which connect with this 1st power terminal and an output terminal sets up the output voltage of the voltage adjustable regulator means in which adjustable is possible as for output voltage, and this voltage adjustable regulator means, the optical disk unit of nine publications.
[Claim 12] An output terminal is connected to this 1st power terminal. The voltage adjustable regulator means in which adjustable is possible as for output voltage, An output voltage setting means to set up the output voltage of this voltage adjustable regulator means, A difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal, and the voltage of this laser diode drive terminal, The claim 8 characterized by forming the controller which controls this voltage setting means so that the detection result of this difference-voltage-detector means is incorporated and the aforementioned difference voltage serves as a predetermined value, the optical disk unit of nine publications.
[Claim 13] The claim 8 characterized by establishing a difference voltage fixed-ized means to carry out adjustable [of the output voltage] and to supply this 1st power terminal so that difference voltage which a difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal and the voltage of this

laser diode drive terminal, and this difference-voltage-detector means detected may be made into a control-input signal and difference voltage may be in agreement with internal-reference voltage, the optical disk unit of nine publications.
[Claim 14] A difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal, and the voltage of this laser diode drive terminal, A triangular-wave generating means to output the triangular wave which makes internal-reference voltage Vref bias voltage, and changes up and down, The claim 8 characterized by building at least one means in this laser driver IC among the comparators which compare with the output voltage of this triangular-wave generating means the difference voltage which this difference voltage-output means detected, the laser driver IC of nine publications, and this laser driver IC The carried optical disk unit.
[Claim 15] The difference-voltage-detector means and the internal-reference voltage Vref which detect the difference voltage of the voltage of this 1st power terminal and the voltage of this laser diode drive terminal are made into bias voltage. The triangular wave which changes up and down The claim 8 characterized by building the comparator which compares with the output voltage of this triangular-wave generating means the difference voltage which a triangular-wave generating means to output, and this difference voltage-output means detected in this laser driver IC, the laser driver IC of nine publications, and this laser driver IC The carried optical disk unit.
[Claim 16] Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 1st laser diode drive terminal is minded. In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode current-output means of supplying the 1st laser diode Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 2nd laser diode drive terminal is minded. The supply place of the output signal of the 2nd laser diode current-output means and these drive current control means supplied to the 2nd laser diode to the laser diode change means and this 1st power terminal which are changed to the 1st or 2nd laser diode current-output means the 1st supply voltage The optical disk unit characterized by preparing the 1st voltage source to supply and the 2nd voltage source which supplies the 2nd supply voltage to these drive current control means.
[Claim 17] Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 1st laser diode drive terminal is minded. In the laser driver IC which builds in the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode current-output means of supplying the 1st laser diode Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 2nd laser diode drive terminal is minded. The supply place of the output signal of the 2nd laser diode current-output means and these drive current control means supplied to the 2nd laser diode for the laser diode change means and this LD current-output means which are changed to the 1st or 2nd laser diode current-output means the 1st supply voltage The optical disk unit which carried the laser driver IC characterized by preparing the 1st power terminal to supply and the 2nd power terminal which supplies the 2nd supply voltage to these drive current control means, and this.
[Claim 18] Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 1st laser diode drive terminal is minded. In

the laser driver IC which builds in the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode current-output means of supplying the 1st laser diode Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 2nd laser diode drive terminal is minded. The supply place of the output signal of the 2nd laser diode current-output means and these drive current control means supplied to the 2nd laser diode for the laser diode change means and this LD current-output means which are changed to the 1st or 2nd laser diode current-output means the 1st supply voltage the 1st power terminal to supply -- this -- the optical disk unit which carried the laser driver IC characterized by preparing the 2nd power terminal which supplies the 2nd supply voltage to built-in circuits other than the 1st and 2nd laser diode current-output meanses, and this

[Claim 19] the voltage of this 1st power terminal -- this -- the difference voltage of the voltage of the 1st laser diode drive terminal, and the voltage of this 1st power terminal -- this -- the difference voltage of the voltage of the 2nd laser diode drive terminal -- detecting -- either -- a minimum difference-voltage-detector means to output the smaller one -- The claim 17 characterized by establishing a difference voltage fixed-ized means to carry out adjustable [of the output voltage] and to supply this 1st power terminal so that difference voltage which this minimum difference-voltage-detector means detected may be made into a control-input signal and difference voltage may be in agreement with internal-reference voltage, the optical disk unit of 18 publications.

[Claim 20] the voltage of this 1st power terminal -- this -- the difference voltage of the voltage of the 1st laser diode drive terminal, and the voltage of this 1st power terminal -- this -- the difference voltage detector of the voltage of the 2nd laser diode drive terminal -- carrying out -- either -- a minimum difference-voltage-detector means to output the smaller one -- A triangular-wave generating means to output the triangular wave which makes internal-reference voltage Vref bias voltage, and changes up and down, The claim 17 characterized by building at least one means in this laser driver IC among the comparators which compare with the output voltage of this triangular-wave generating means the difference voltage which this minimum difference voltage-output means detected, the laser driver IC of 18 publications, and this laser driver IC The carried optical disk unit.

[Claim 21] the voltage of this 1st power terminal -- this -- the difference voltage of the voltage of the 1st laser diode drive terminal, and the voltage of this 1st power terminal -- this -- the difference voltage detector of the voltage of the 2nd laser diode drive terminal -- carrying out -- either -- a minimum difference-voltage-detector means to output the smaller one -- A triangular-wave generating means to output the triangular wave which makes internal-reference voltage Vref bias voltage, and changes up and down, The optical disk unit which carried the claim 17 characterized by building the comparator which compares with the output voltage of this triangular-wave generating means the difference voltage which this minimum difference voltage-output means detected in this laser driver IC, the laser driver IC of 18 publications, and this laser driver IC.

[Claim 22] Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 1st laser diode drive terminal is minded. In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode

current-output means of supplying the 1st laser diode Carry out the current supply source of the current proportional to the input signal through the 3rd power terminal, and the 2nd laser diode drive terminal is minded. The supply place of the output signal of the 2nd laser diode current-output means and these drive current control means supplied to the 2nd laser diode to the laser diode change means and this 1st power terminal which are changed to the 1st or 2nd laser diode current-output means the 1st supply voltage The optical disk unit characterized by preparing the 1st voltage source to supply, the 3rd voltage source which supplies the 3rd supply voltage to this 2nd power terminal, and the 2nd voltage source which supplies the 2nd supply voltage to these drive current control means.

[Claim 23] Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 1st laser diode drive terminal is minded. In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode current-output means of supplying the 1st laser diode Carry out the current supply source of the current proportional to the input signal through the 3rd power terminal, and the 2nd laser diode drive terminal is minded. To the 2nd laser diode the laser diode change means which changes the supply place of the output signal of the 2nd laser diode current-output means and these drive current control means to supply to the 1st or 2nd laser diode current-output means -- this -- the 1st supply voltage for the 1st laser diode current-output means the 1st power terminal to supply -- this -- the optical disk unit which carried the laser driver IC characterized by preparing the 3rd power terminal which supplies the 3rd supply voltage to the 2nd laser diode current-output means, and the 2nd power terminal which supplies the 2nd supply voltage to these drive current control means, and this

[Claim 24] The claims 16, 17, 18, 19, 20, 21, and 22 characterized by forming the controller which controls this laser diode change means corresponding to the result of a disk kind detection means to distinguish the kind of disk, and this detection means, the optical disk unit of 23 publications.

[Claim 25] A triangular-wave generating means to output the triangular wave which makes internal-reference voltage Vref bias voltage, and changes this difference voltage fixed-ized means up and down, The comparator which compares with the output voltage of this triangular-wave generating means the difference voltage which this difference voltage-output means detected, The claims 4, 13, and 19 characterized by considering as a difference voltage fixed-ized means with the switching element which one side is connected [switching element] to a voltage source, and another side is connected [switching element] to this 1st power terminal through an inductor, and has switching operation controlled by the output of this comparator, the optical disk unit of a publication.

[Claim 26] The claims 4, 5, 6, 12, 13, 14, 15, 19, and 20 characterized by having communalized this 1st voltage source and this 2nd voltage source, and considering as the 2nd one voltage source, the optical disk unit of 21 publications.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the optical disk unit which performs informational record reproduction using the laser beam of semiconductor laser diode.

[0002]

[Description of the Prior Art] The optical disk unit used as the information storage device of a note type or a carried type personal computer and information back equipment of carried type audio visual information machines and equipment needs to correspond to large capacity-ization of the amount of information treated from a use device's by a miniaturization, operation[prolonged]-izing by cell operation, and multimedia information processing-ization (it treats to a dynamic image). As an optical disk unit, if the own formation of small large capacity of equipment, low-power-izing, and portability are taken into consideration, earthquake-proof improvement will serve as a technical problem.

[0003] Low-power-ization is one important technical problem, and it influences in an operating-environment temperature requirement strongly by the temperature rise in equipment by internal generation of heat of an optical disk unit and a use device while it influences prolonged operation-ization of equipment. If a use device and an optical disk unit are miniaturized more, the thermolysis effect will decrease and it will become elevation of the temperature in equipment more.

[0004] The recording density in an optical disk unit and storage capacity are governed by the diameter of an optical spot formed on a disk. Moreover, the diameter of an optical spot is proportional to the oscillation wavelength of a laser diode. a mini disc -- the present high-density record optical disk units, such as 780nm and DVD, -- 650nm -- red laser diode use is carried out Furthermore densification is aimed at and the blue laser diode of 420nm class is utilization developing. However, while the threshold current which carries out an oscillation start increases as the oscillation wavelength of laser diode becomes small, forward voltage also increases. In the case of 780nm, it will be set to 5V if it becomes about 2.7V and 420nm class in the case of about 2.1V and 650nm. Therefore, own power consumption and own calorific value of a laser diode become large by increase of threshold current, and increase of forward voltage. Moreover, it is one technical problem how the efficiency of a laser driver in which forward voltage also has variation and drives laser diode is improved. The efficiency of a laser driver is so good that it is large by the ratio of the power which the laser diode to the sum total power

consumption which a laser driver and a laser diode consume consumes.
[0005] With power consumption increase of laser diode, if the efficiency of a laser driver is bad, it will serve as a bigger power loss and will serve as generation of heat of a laser driver. If a laser driver generates heat, the temperature of a laser diode will be raised. A laser diode needs to pass further much current, in order to obtain the same luminescence quantity of light, since threshold current will increase if temperature rises. It will become vicious circle that as a result the temperature of a laser driver rises further.
[0006] The composition of the conventional laser driver is shown in drawing 6 . (In addition, henceforth) LD a laser diode The current Iin1, Iin2, and Iin3 set up with a current setting means 1 to mean is amplified by Ia1, Ia2, and Ia3 with the current amplification means 2 (in addition). (the amplification factor is decided by the ratio of the emitter size of transistor Q*b by which diode connection was made by 20 times, and transistor Q*a) * It is added with the addition means 4 through the switching means 3 which mean 1, 2, and 3, and LD current-output means 5 is supplied. The output current Ib of the addition means 4 is amplified 5 times with Transistor Qe and Transistor Qf by which diode connection was made also in LD current-output means 5, and Current Iout is supplied to a laser diode 10 through LD drive terminal 9. Switch **** 3 consists of differential pairs of transistor Q*d by which BEZU was connected to control signal A* from transistor Q*c and the controller 16 by which the base was connected to the bias voltage Vb of a bias circuit 31, if its level of control signal A* is higher than Vb, transistor Q*d turns it on, current Ia* is led to the addition means 4 (this current is made into Id*), and it is added. When the level of control signal A* is low, as for Q*d, an off state and Q*c will be in on state, and current Ia* will be led to the 1st power terminal. (This current is made into Ic*) Since the output current Id of the addition means 4 is led to the 1st power terminal 8 through Qe of LD current-output means 5, all current Ia* inputted into switching means 3 as a result will be led to the 1st power terminal 8 again.
[0007] It is as follows when the above current relation is summarized from a viewpoint of the power consumption of a laser driver. Current Ivcc which flows to the laser driver earth terminal 15 from the output current Iout and the 1st power terminal 8 of LD current-output means Iout=sigma(Iin*) (x20x5) x (A*) (formula 1)
however -- *= -- 1, 2, and 3A*= -- 1 (when level is high) and 0 (in the low case [Level])
Ivcc= sigma(Iin*) x20+Ibias (formula 2)
It becomes.
[0008] If the power consumption Wdrv of the laser driver 7 sets forward voltage of Vcc1 and a laser diode 10 to VF for the voltage of the 1st power terminal 8 Wdrv=Ioutx(Vcc1-VF)+IvccxVcc1 (formula 3)
It becomes.
[0009] Since it depends on a laser diode 10 for the current Iout supplied to a laser diode 10, reduction of Iout is concerned with the own improvement of a laser diode. Therefore, improvement in efficiency of the laser driver 7 has started how (Vcc1-VF) and IvccxVcc1 are made small from the upper formula.
[0010] Usually, 5V turned an analog signal system with 3V and the standard logic system which turn the internal-electrical-power-source voltage of an optical disk unit a low-battery logic system, and 12V for motor drivers are prepared.
[0011] here -- forward voltage VF -- standard 2.7 -- V a maximum of 3.2 -- since it corresponds to the red laser diode which is 650nm which is V -- the minimum ends

voltage (voltage between terminals of the 1st power terminal 8 and LD drive terminal 9) Vdmin 1.2 [about] of LD current-output means 5 -- when V is taken into consideration, the supply voltage of the laser driver 7 is or more [4.4] V need Therefore, it is conventionally referred to as 5V. however -- if supply voltage required for the current amplification means 2, switching means 3, and the addition means 4 sets to 1.2V VCE which the aggregate value of the VCE voltage (collector to emitter voltage) of transistor Q*a of the current amplification means 2 and the VCE voltage of transistor Q*c of switching means 3 is sufficient as, and guarantees each transistor current amplification operation -- a total of 2.4 -- V is sufficient

[0012] Therefore, 2.6 V (supply voltage 5V-required voltage 2.4 V) parts with excessive excessive 0.6V (supply voltage 5V-required voltage 4.4 V) in LD current-output means 5 and other portions will consume unnecessary power conventionally.

[0013] Moreover, as for a laser driver, in the case of the optical disk unit which needs both red laser diode and blue laser diode (equipment corresponding to the disk recorded in red in the past), it is desirable to make it one and to drive two laser diodes in respect of the miniaturization of equipment. However, the supply voltage of a laser driver serves as voltage about 5 V+alpha of the large blue laser diode of forward voltage VF in this case, and when operating a red laser diode with this equipment, unnecessary bigger power will be consumed.

[0014]

[Problem(s) to be Solved by the Invention] The technical problem of this invention is reducing the power consumption and generation of heat with an unnecessary optical disk unit which carried the laser driver and this which drive one laser diode.

[0015] Furthermore, it is reducing the power consumption and generation of heat with an unnecessary optical disk unit which carried the laser driver and this which drive both red laser diode and blue laser diode.

[0016]

[Means for Solving the Problem] In the optical disk unit which has a LD current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the current to which this invention is proportional to an input signal to laser diode through LD drive terminal, the output terminal was connected to this 1st power terminal, and output voltage established the voltage adjustable regulator means in which adjustable is possible.

[0017] Moreover, it sets to the laser driver IC which builds in the drive current control means which generate the signal wave form inputted into LD current-output means and this LD current-output means of a current supply source being carried out through the 1st power terminal, and supplying the current proportional to the input signal to a laser diode through LD drive terminal. The 1st voltage source which supplies the 1st supply voltage to the laser driver IC which prepared the 1st power terminal which supplies the 1st supply voltage to this LD current-output means, and the 2nd power terminal which supplies the 2nd supply voltage to these drive current control means, and this 1st power terminal, The 2nd voltage source which supplies the 2nd supply voltage to these drive current control means, a difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal, and the voltage of this LD drive terminal, A difference voltage fixed-ized means to have carried out adjustable [of the output voltage] and to supply this 1st power terminal so that difference voltage which this difference-voltage-detector

means detected may be made into a control-input signal and difference voltage may be in agreement with internal-reference voltage was established.
[0018] moreover Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and 2nd LD drive terminal is minded. To the 2nd laser diode To the 1st power terminal and these drive current control means which supply the 1st supply voltage to LD change means and this LD current-output means which change the supply place of the output signal of 2nd LD current-output means and these drive current control means to supply to the 1st or 2nd LD current-output means, the 2nd supply voltage the laser driver IC which prepared the 2nd power terminal to supply, and the voltage of this 1st power terminal -- this -- the difference voltage of the voltage of 1st LD drive terminal, and the voltage of this 1st power terminal -- this -- the difference voltage detector of the voltage of 2nd LD drive terminal -- carrying out -- either -- a minimum difference-voltage-detector means to output the smaller one -- A difference voltage fixed-ized means to have carried out adjustable [of the output voltage] and to supply this 1st power terminal so that difference voltage which this minimum difference-voltage-detector means detected may be made into a control-input signal and difference voltage may be in agreement with internal-reference voltage was established.
[0019] Moreover, the controller which controls this LD change means corresponding to the result of a disk kind detection means to distinguish the kind of disk, and this detection means was formed.
[0020]
[Embodiments of the Invention] The 1st example of this invention is shown in drawing 1 .
[0021] The drive current control means 6 and LD current-output means 5 which consist of the current amplification means 2 and switching means 3 which explained this optical disk unit in a current setting means 1 to set up the size of three current Iin1, Iin2, and Iin3, and the aforementioned conventional example, and an addition means 4, and an output terminal are connected to this 1st power terminal, and output voltage has an output voltage setting means 14 set up the output voltage of the voltage adjustable regulator means 12 in which adjustable is possible, and the voltage adjustable regulator The example of the voltage setting means 14 is variable resistance etc. The supply voltage of the drive current control means 6 and LD current-output means 5 is supplied from the 1st power terminal 8. This composition is the same as the conventional example.
[0022] Corresponding to the forward voltage VF of a laser diode 10, the voltage setting means 14 can adjust the supply voltage of the laser driver 7 whole so that the ends voltage of LD current-output means 5 may become a predetermined value (about 1.2 V).
[0023] Since the effect of this 1st example sets the ends voltage of 1LD current-output stage 5 as the necessary minimum voltage on which LD current-output means 5 operates, it can stop the power consumption (product of drive current and ends voltage) of LD current-output stage 5 by the drive current of a laser diode 10 to the minimum.
[0024] 2) Further, since the power consumption of LD current-output means 5 can be reduced, generation of heat with LD current-output means 5 can be reduced.
[0025] 3) Since the supply voltage of the laser driver 7 whole also falls in the case of the laser diode 10 in case the set-up voltage falls from the conventional supply voltage The power consumption in flocks other than LD current-output means 5 (drive current control

means 6 etc.) can be lowered. By these, the power consumption of the whole optical disk unit and calorific value can be reduced.
[0026] 5) The power consumption and calorific value of the whole optical disk unit in which a DC-DC KOMPATA ******** switching regulator, ****, and conversion loss included the voltage adjustable regulator means 12 voltage adjustable regulator means 12 comparatively small (a conversion efficiency is 90% or more, and loss is usually 10% or less) can be reduced.
[0027] 6) Moreover, although the power consumption of the whole optical disk unit cannot reduce the voltage adjustable regulator 12 when a three terminal type series regulator is used, the power consumption of laser driver 7 self can be reduced, and can also reduce calorific value proportionally. This can reduce deformation by heat concentration of the optical pickup which carried the laser driver 7 etc.
[0028] 7) Since it is expected in the case of the laser diode of 420nm classes that the variation also becomes large since VF is about 5V, compared with the voltage-clamp-ized conventional example, the unnecessary power consumption of LD current-output means 5 can be reduced more.
[0029] However, the difficulty of this 1st example needs to correspond to the variation in VF of laser diode 10, and needs to set up and adjust supply voltage with a help for every optical disk unit.
[0030] The 2nd example of this invention is shown in drawing 2 .
[0031] The same number is given to the same component as the conventional example of drawing 6 , and the 1st example.
[0032] This optical disk unit is considered as the composition which formed the 1st power terminal 8 which supplies the 1st supply voltage to the laser driver 7 at LD current-output means 5, and the 2nd power terminal 17 which supplies the 2nd supply voltage to the drive current control means 6. Supply voltage Vcc1 is supplied to the 1st power terminal 8 from the 1st voltage source 13. Supply voltage Vcc2 is supplied to the 2nd power terminal 17 from the 2nd voltage source 18.
[0033] Thus, the power supply of LD current-output means 5 which needs high voltage, and the drive current control means 6 which operate also on low voltage is separated inside IC of the laser driver 7. Supply voltage required thereby respectively can be supplied.
[0034] Unnecessary power can be reduced by supplying the respectively optimal voltage among 3V, 5V, and 12V which are prepared in equipment. For example, if it is made into Vcc1=5V and Vcc2=3V in the case of a 650nm laser diode, since it will compare with the conventional example and supply voltage of the drive current control means 6 can be made low from 5V 3V, the power consumption in the drive current control means 6 can be reduced to three fifths.
[0035] The 3rd example of this invention is shown in drawing 3 .
[0036] In the example of drawing 2 , it connects with this 1st power terminal 8, and the output terminal is making this optical disk unit the composition in which output voltage formed an output voltage setting means 14 to set up the output voltage of the voltage adjustable regulator means 12 in which adjustable is possible, and this voltage adjustable regulator means 12.
[0037] That is, the power supply of LD current-output means 5 and the drive current control means 6 is separated, and supply voltage of LD current-output means is made the

composition in which adjustable is possible.
[0038] Thereby, like the 1st example (drawing 1), since arbitrary voltage can be supplied to the 1st power terminal 8 by the voltage adjustable regulator means 12 and the voltage setting means 14, the power consumption in LD current-output means 5 can be stopped as well as the 1st example (drawing 1) to the minimum. Moreover, since the supply voltage Vcc2 of the drive current control means 6 can use 3V currently prepared with the power supply in equipment, the power consumption of this portion can be reduced like the example (drawing 2) of 2.
[0039] However, the difficulty of this example needs to perform setup and adjustment of Vcc1 with a voltage setting means for every equipment by the help like the 1st example (drawing 1).
[0040] The 4th example of this invention is shown in drawing 4 .
[0041] This optical disk unit is made the composition which formed the controller 16 which controls the voltage setting means 140 so that the detection result Vd of the difference-voltage-detector means 19 and the difference-voltage-detector means 19 which detects the difference voltage Vd of the voltage Vcc1 of the 1st power terminal 8 and the voltage of LD drive terminal 9 is incorporated and the aforementioned difference voltage Vd serves as a predetermined value in the 3rd example (drawing 3).
[0042] In things, the voltage setting means 140 is [means / voltage setting / 14 / above-mentioned] the composition which can be set up from a controller 16, for example, is constituted from a D/A converter etc., supplies the voltage corresponding to the instruction value from a controller 16 to the voltage adjustable regulator means 12, and carries out adjustable / of the output voltage /.
[0043] The control action of the supply voltage Vcc1 of the 1st power terminal 8 of this example is explained using drawing 5 .
[0044] Current-value Iin* of the programmed-current setting means 1 and the switch state of switching means 3 are controlled by control signal A* so that the output current Iout of LD drive current-output means 5 serves as predetermined current value by the controller and step1. Predetermined current value is made into the current level which does not destroy the record data currently recorded on the optical disk. For example, it is set as the current value equivalent to reproduction light power.
[0045] Then, the detection result Vdet of the difference-voltage-detector means 19 is incorporated by step2, and a detection value judges whether it is a predetermined range by step3. The predetermined range is the range of the voltage Vdmin between the minimum ends by which the guarantee of operation of the LD current-output means 5 is offered to Vdmin+alpha, and alpha is a measurement error and a value in consideration of noise change etc. When detected Vdet is contained in the above-mentioned range, Vcc1 voltage adjustment is ended. It judges whether in ******, the detection value Vdet is larger than the aforementioned range at step4. When the detection value Vdet is large, it is specified quantity lower ** about the set point of the voltage setting means 140 at step5. When the detection value Vdet is low, it is specified quantity higher ** about the set point at step6. It returns to step2 after that, and it repeats until the detection value Vdet goes into the predetermined range.
[0046] Thus, the ends voltage Vdet of LD current-output means 5 can be set automatically to Vdmin which guarantees the operation. At this time, the supply voltage Vcc1 of the 1st power terminal 8 serves as Vcc1=Vdmin+VF. Since Vdmin is uniformly

controlled even if the forward voltage VF of laser diode 10 differs with every optical disk unit, Vcc(s)1 also differ corresponding to this.
[0047] The 5th example of this invention is shown in drawing 7 .
[0048] In the 4th above-mentioned example (drawing 4), this composition loses the 1st voltage source 13 inputted into the voltage adjustable regulator 12, and inputs it from the 2nd voltage source 18 which supplies voltage to drive current control means instead. Although the voltage of the 2nd voltage source 18 is 3V, this is controlled by the voltage adjustable regulator by the controller so that the output voltage of pressure-up Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. serves as above-mentioned Vdmin+VF.
[0049] The number of the current supply lines to the optical-pickup section (it corresponds to the record regenerative-track position of a disk, and is ******) which carries the laser driver 7 section by this in addition to the effect of the 4th example (drawing 4) can be reduced.
[0050] The 6th example of this invention is shown in drawing 8 .
[0051] This example is the composition replaced by difference voltage fixed-ized means 20 to carry out adjustable [of the output voltage Vcc1], and to supply the 1st power terminal 8 so that difference voltage Vdet on which the difference-voltage-detector means 19 detected the 4th voltage adjustable regulator 12 and voltage setting means 140 of an example (drawing 4) may be made into a control-input signal and the difference voltage Vdet may be in agreement with the internal-reference voltage Vref.
[0052] The internal configuration of the difference voltage fixed-ized means 20 is shown in drawing 9 . This composition is the composition of a general switching regulator. The 1st voltage source 13 is made into the source of input voltage, the detection result Vdet of the difference-voltage-detector means 19 is made into a control-input signal, and it becomes one input signal of a comparator 205. The output voltage Vosc of the triangular-wave generating means 206 is inputted into the input of another side of a comparator 205. The oscillation frequency f is set up by the capacitor 207, and the triangular-wave generating means 206 outputs the wave which makes internal-reference voltage Vref bias and carries out voltage change in triangular wave on frequency f up and down.
[0053] A comparator 205 compares these both voltage and performs on of a switching element 201, and off control. The power from the 1st voltage source is outputted through a switching element 201 and an inductor 203. 202 is the diode for flywheels and 204 is a capacitor for smooth.
[0054] If the detection value Vdet of the difference-voltage-detector means 19 is larger than Vref, the flow ratio (flow ratio between the periods of frequency f) of a switching element 201 will become small, and output voltage Vcc1 becomes [the power supplied to the 1st power terminal from the 1st voltage source 13] small small as a **** result. Conversely, if Vdet is smaller than Vref, a flow ratio becomes large, a supply voltage will also become large and Vcc1 will become high. By this feedback control loop, Vcc1 voltage is changed so that Vdet and Vref may be in agreement. If Vref is set as the voltage Vdmin between the minimum ends in which LD current-output means 5 offers a guarantee of operation, it is controllable so that Vdet is in agreement with Vdmin.
[0055] since in addition to the above-mentioned effect the effect of this example is controlling the controller 16 so that it does not intervene but Vdet is always in agreement with Vref (Vdmin), even if VF of a laser diode 10 changes by the working temperature

change of an optical disk unit, it can carry out [****]-izing of the ends voltage Vd of LD current-output means 5 to Vdmin Moreover, although it is at the record-on disk, and reproduction time, the drive current of a laser diode 10 differs and VF also changes, since supply voltage Vcc1 is changed fixing Vdim corresponding to this, an unnecessary power loss can be reduced more finely.

[0056] The 7th example of this invention is shown in drawing 10 .

[0057] Although this example carries out the same operation as the 6th example (drawing 8), the composition of the laser driver 7 (semiconductor integrated circuit of one chip) differs. As shown in drawing, some components of the difference-voltage-detector means 19 and the difference voltage fixed-ized means 20 are made the composition made to build in the laser driver 7. The difference-voltage-detector means 19, the triangular-wave generating means 205, and the comparator 205 are made to specifically build in. The connection relation is the same as the 6th example (drawing 8).

[0058] the effect of this example -- the effect of the 6th example (drawing 8) -- adding -- a part of difference-voltage-detector means 19 and difference voltage fixed-ized means 20 -- since it was made to build in the circuit laser driver 7 and 1 chip is formed, it becomes possible for there to be few passive-circuit-elements mark, to end, and to advance the miniaturization it is [miniaturization] equipment

[0059] The 8th example of this invention is shown in drawing 11 .

[0060] low-power-izing of the optical disk unit for which the aim of this example needs two or more laser diodes, and generation of heat -- **** -- it is-izing

[0061] This example is set in the 2nd example (drawing 2). The 1st power terminal 8 is laser minded [7] for the current proportional to the input signal. A current supply source is carried out and 2nd LD drive terminal 91 is minded. To the 2nd laser diode 101 To the 1st power terminal 8 and drive current control means 6 which supply the 1st supply voltage to LD change means 21 which changes the supply place of the output signal of 2nd LD current-output means 51 and the drive current control means 6 to supply to the 1st or 2nd LD current-output means, and LD current-output means, the 2nd supply voltage It is the composition of having established a disk kind detection means 160 to detect the kind of the 2nd power terminal 17 to supply and disk.

[0062] If a disk is inserted, a controller 16 will incorporate and distinguish the detection result of the disk kind detection means 160. The contents of distinction are in the disk corresponding to the 1st laser diode 10, and the disk corresponding to the 2nd laser diode 101. When a disk corresponds to the 1st laser diode 10, in order to obtain corresponding drive current wave type, the current value of each current source of the current setting means 1 is set up. Moreover, LD change means is controlled by the SEL signal from a controller 16, and the output signal of the drive current control means 6 is supplied to 1st LD current-output means. Moreover, in order to generate a corresponding wave at the time of record, switching means 3 are controlled by the control signal of A1, A2, and A3. The output signal of the drive current control means 6 is supplied to 1st LD current-output means 5 through LD change means, and a laser diode 10 drives it. At this time, since current is not supplied from 2nd LD current-output means, the 2nd laser diode will be in an off state.

[0063] When the detected disk corresponds to the 2nd laser diode 101 The drive current signal which corresponds by control of the switching means 3 from the corresponding programmed-current value and corresponding controller 16 of the current setting means 1

is outputted from the drive current control means 6. Both the supply voltage of the 1st and 2nd LD current-output means is connected to the 1st power terminal 8 for this example that 2nd LD current-output means 51 is supplied through LD change means 21, and the 2nd laser diode drives. Therefore, the voltage which doubled the voltage Vcc1 of the 1st power terminal 8 with the one where the forward voltage VF of a laser diode is larger is needed. if a laser diode 10 is made into a red laser diode, a laser diode 101 is made into a blue laser diode and each forward voltage is set to VF (red) and VF (blue) -- VF(red) =2.7-3.2V and VF(blue) = -- about 5 -- it is V As for Vcc1, more than the aggregate value (about 6.2 V) of voltage Vdmin=1.2V and VF (blue) is needed after this between the minimum ends of LD current-output means which offer a guarantee of operation. The supply voltage Vcc2 of the drive current control means 6 is good 3V.

[0064] Consequently, although Vcc1 and Vcc2 needed to make it about 6.2 V in the case of the conventional example, by this example, only Vcc 1 is set to 6.2V, and Vcc2 ends, while it has been 3V near [where drive current control means operate] the minimum voltage (since the power supply was not independent). Thereby, increase of the unnecessary power consumption by the rise of the supply voltage Vcc2 in the drive current control means 6 is avoidable.

[0065] The 9th example of this invention is shown in drawing 12 .

[0066] This example is what was made the composition which separated the power supply of 1st LD current-output means 5 and 2nd LD current-output means 51 in the 8th example (drawing 11). Supply voltage Vcc1 is supplied to 1st LD current-output means 5 through the 1st power terminal 8 from the 1st voltage source 13, and it is made the composition which supplies supply voltage Vcc3 to 2nd LD current-output means 51 through the 3rd more newly than the 3rd newly prepared voltage source 131 prepared power terminal 81.

[0067] This becomes possible to set up the 1st and the 3rd voltage source corresponding to VF of a laser diode 10,101. Corresponding to VF(red) =2.7-3.2V of the red laser diode 10, the voltage Vcc1 of the 1st voltage source 13 is set as VF(red)+Vdmin=3.2V+1.2V=4.3V (or 5V which it has to equipment). Corresponding to VF(blue) = abbreviation 5V of the blue laser diode 101, the voltage Vcc3 of the 3rd voltage source 131 can be set as 5V+1.2V=6.3V. However, since it is not standardly prepared in equipment, it is necessary to newly prepare these Vcc3=6.3V.

[0068] Thus, since supply voltage can be separately set up corresponding to VF, it becomes possible to stop the power consumption in the 1st and 2nd LD current-output means 10,101 to the minimum, respectively.

[0069] The 10th example of this invention is shown in drawing 13 .

[0070] This example is set in the 8th example (drawing 11). The difference voltage Vd1 of the voltage Vcc1 of the 1st power terminal 8 and the voltage of 1st LD drive terminal 9 and the difference voltage Vd2 of the voltage Vcc1 of the 1st power terminal 8 and the voltage of 2nd LD drive terminal 91 are detected. either A minimum difference-voltage-detector means 190 to output the smaller one, It is made the composition which established a difference voltage fixed-ized means 20 to have carried out adjustable [of the output voltage Vcc1], and to supply the 1st power terminal 8 so that difference voltage Vd which the minimum difference-voltage-detector means 190 detected may be made into a control-input signal and the difference voltage Vd may be in agreement with the internal-reference voltage Vref.

[0071] This example performs control action of Vcc1 as well as the control of Vcc1 by the difference-voltage-detector means 19 of the 6th example (drawing 8) and difference voltage fixed-ized means which were mentioned above. A different point from the 6th example (view 8) is a point which made the difference-voltage-detector means 19 the minimum difference-voltage-detector means 190.
[0072] When the detection result of the disk kind detection means 160 corresponds to the red laser diode 10, the red laser diode 10 drives by 1st LD current-output means 5 with LD change means 21. The blue laser diode 101 does not drive at this time. The voltage of 2nd LD drive terminal 91 which supplies current to the blue laser diode 101 as a result becomes grounding potential, and, as for LD drive terminal 9 of another side 1st, forward voltage VF(red) =2.7V-3.2V of a red laser diode occur. At this time, since Vcc1-VF (red) and the difference voltage Vd2 are set to Vcc1-0V by the difference voltage Vd1, the output voltage Vdet of the minimum difference-voltage-detector means 190 serves as Vcc1-VF (red). That is, the minimum difference-voltage-detector means 190 detects the voltage between ends of LD current-output means corresponding to the laser diode which is operating. Voltage between ends of a LD current-output means by which the minimum difference-voltage-detector means 190 is chosen by the controller 16, and it is operating is not detected, and an internal configuration is not captured by that.
[0073] Consequently, since the output value Vd of the minimum difference-voltage-detector means 190 is supplied to the difference voltage fixed-ized means 20, Vcc1 voltage serves as VF(red)+Vdmin.
[0074] Moreover, in the case of the disk corresponding to the blue laser diode 101 in the detection result of the disk kind detection means 160, 2nd LD current-output means 51 operates by LD change means, and the blue laser diode 101 is driven through 2nd LD drive terminal 91. this -- it comes, and the voltage Vd2 between ends of 2nd LD current-output means 51 becomes small, and the minimum difference-voltage-detector means 190 supplies this voltage to a difference voltage fixed-ized means Consequently, Vcc1 voltage serves as VF(blue)+Vdmin.
[0075] a disk -- which laser diode -- be -- since Vcc1 voltage which serves as dmin in the voltage between ends of LD current-output means corresponding to the laser diode which is operating is supplied to the 1st power terminal 8, it becomes possible to hold down to necessary minimum power consumption
[0076] The power consumption of the laser driver 7 in this example (IC) can be minimized, respectively with the 3Vx consumed electric current of the drive current control means 6, and the Vmin(=1.2V) x laser diode drive current Iout of LD current-output means.
[0077] The 11th example of this invention is shown in drawing 14 .
[0078] Although this example carries out the same operation as the 10th example (drawing 13), the composition of the laser driver 7 (semiconductor integrated circuit of one chip) differs. As shown in drawing, some components of the minimum difference-voltage-detector means 190 and the difference voltage fixed-ized means 20 are made the composition made to build in the laser driver 7. The minimum difference-voltage-detector means 190, the triangular-wave generating means 205, and the comparator 205 are made to specifically build in. The connection relation is the same as the 10th example (drawing 13).
[0079] the effect of this example -- the effect of the 10th example (drawing 13) --

adding -- a part of minimum difference-voltage-detector means 190 and difference voltage fixed-ized means 20 -- since it was made to build in the circuit laser driver 7 and 1 chip is formed, it becomes possible for there to be few passive-circuit-elements mark, to end, and to advance the miniaturization it is [miniaturization] equipment

[0080]

[Effect of the Invention] Since it can set automatically in the minimum voltage Vdmin between ends (about 1.2 V) in which operation [supply voltage / of LD current-output means 10 / Vcc1] of LD current-output means is possible, and the value adding VF (=2.7V) of a laser diode 10 according to this invention, the power consumption of LD current-output means can be stopped to the minimum. For example, if the drive current Iout of a laser diode is set to 150mA, LD current-output means will be set to W(output stage) = VdminxIout=1.2Vx150mA=180mW. On the other hand, since it was fixing with Vcc1=5V conventionally, it is W(output stage) =(Vcc1-VF) xIout=2.3Vx150mA=345mW, and it becomes possible to carry out the abbreviation reduction by half of the power consumption of LD current-output means by this invention.

[0081] Moreover, since it becomes possible to lower the supply voltage of this portion from conventional 5V to 3V since high voltage dissociates with required LD current-output means and is enabling supply of the internal-circuitry power supply of laser drivers 7 other than LD current-output means independently, ** which reduces the power consumption of this portion to three fifths becomes possible. Conventionally, since the consumed electric current of this portion is about 30mA, it can reduce 150mW to 90mW.

[0082] Since it becomes possible to carry out the abbreviation reduction by half of the own power consumption of these laser driver, own generation of heat of a laser driver can be reduced by half, and it becomes possible to carry in an optical pickup, to generate heat locally, and to reduce the temperature rise to a laser driver, deformation by local heat concentration of an optical-pickup case, etc.

[0083] Moreover, since the power consumption of a laser diode was 150mAx2.7V=405W, in view of the viewpoint of the total power consumption of a laser driver and a laser diode, it was 345mW+150mW+405mW=900mW conventionally. On the other hand, in this invention, since it is carrying out adjustable [of the supply voltage] by the so-called DC-DC converter in order to control Vcc1 automatically, it is necessary to take loss in this portion into consideration. When efficiency of a DC-DC converter is usually made into 95% of a value, 5% of the power outputted from a DC-DC converter makes power consumption total as loss increased. The power Wout which should be outputted from a DC-DC converter is Wout=180mW(LD current-output means)+90mW(drive current control means)+405mW (laser diode). The loss Wloss of a =675 mWDC-DC converter is set to Woutx0.05=34mW.

[0084] The total power consumption which, as a result, includes DC-DC converter loss is set to 675mW+34mW=709mW, and it becomes possible to reduce about 200mW conventionally. That is, it becomes possible to reduce not only the power consumption and generation of heat of a laser driver but total power.

[0085] Moreover, reduction of this power consumption corresponds to VF of the laser diode chosen, respectively when driving blue laser diode and red laser diode by the same laser driver, and is Vcc1 voltage. Since it is referred to as Vcc1=Vdmin(voltage between ends of LD current-output means : 1.2 V)+VF, ** which always reduces the power consumption of a laser driver to the minimum becomes possible.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing showing the 1st example of this invention.
[Drawing 2] Drawing showing the 2nd example of this invention.
[Drawing 3] Drawing showing the 3rd example of this invention.
[Drawing 4] Drawing showing the 4th example of this invention.
[Drawing 5] Flows of control of the controller 16 of the 4th example.
[Drawing 6] Drawing showing the composition and the internal circuitry of the conventional example.
[Drawing 7] Drawing showing the 5th example of this invention.
[Drawing 8] Drawing showing the 6th example of this invention.
[Drawing 9] Drawing showing the internal configuration of the difference voltage fixed-ized means of the 6th example.
[Drawing 10] Drawing showing the 7th example of this invention.
[Drawing 11] Drawing showing the example of the octavus of this invention.
[Drawing 12] Drawing showing the 9th example of this invention.
[Drawing 13] Drawing showing the 10th example of this invention.
[Drawing 14] Drawing showing the 11th example of this invention.
[Description of Notations]
1 ... Current setting means 2 ... Current amplification means
3 ... Switching means 4 ... Addition means
5 ... LD current-output means 6 ... Drive current control means
7 ... Laser driver 8 ... The 1st power terminal
9 ... LD drive terminal 10 ... Laser diode
11 ... Earth terminal 12 ... Voltage adjustable regulator means
13 ... The 1st voltage source 14 ... Voltage setting means
15 ... Laser driver earth terminal 16 ... Controller
17 ... The 2nd power terminal 18 ... The 2nd voltage source
19 ... Difference-voltage-detector means 20 ... Difference voltage fixed-ized means
201 ... Switching element 203 ... Inductor
205 ... Comparator 206 ... Triangular-wave generating means
160 ... Disk kind detection means 21 ... LD change means

[Translation done.]

CORRECTION or AMENDMENT

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[Procedure amendment 1]

[Document to be Amended] Specification.

[Item(s) to be Amended] The name of invention.

[Method of Amendment] Change.

[Proposed Amendment]

[Title of the Invention] An optical disk unit and the laser diode drive method.

[Procedure amendment 2]

[Document to be Amended] Specification.

[Item(s) to be Amended] Claim.

[Method of Amendment] Change.

[Proposed Amendment]

[Claim(s)]

[Claim 1] In the optical disk unit which has a laser diode current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the

current proportional to the input signal to laser diode through LD drive terminal
The optical disk unit characterized by having connected with this 1st power terminal, for output voltage having established the voltage adjustable regulator means in which adjustable is possible, and an output terminal making possible adjustable [of the supply voltage of this laser diode current-output means].
[Claim 2] In the optical disk unit which has a laser diode current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the current proportional to the input signal to laser diode through a laser diode drive terminal
The optical disk unit with which an output terminal is connected to this 1st power terminal, and output voltage is characterized by having established an output voltage setting means to set up the output voltage of the voltage adjustable regulator means in which adjustable is possible, and this voltage adjustable regulator means, and making possible adjustable [of the supply voltage of this laser diode current-output means].
[Claim 3] The optical disk unit according to claim 2 characterized by forming the controller which controls this voltage setting means so that the detection result of a difference-voltage-detector means and this difference-voltage-detector means which detects the difference voltage of the voltage of this 1st power terminal and the voltage of this laser diode drive terminal is incorporated and the aforementioned difference voltage serves as a predetermined value.
[Claim 4] In the optical disk unit which has a laser diode current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the current proportional to the input signal to laser diode through a laser diode drive terminal
The optical disk unit characterized by establishing a difference voltage fixed-ized means to carry out adjustable [of the output voltage] and to supply this 1st power terminal so that difference voltage which a difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal and the voltage of this laser diode drive terminal, and this difference-voltage-detector means detected may be made into a control-input signal and difference voltage may be in agreement with internal-reference voltage.
[Claim 5] In the optical disk unit which has a laser diode current-output means for a current supply source to be carried out through the 1st power terminal, and to supply the current proportional to the input signal to laser diode through a laser diode drive terminal
The optical disk unit characterized by building in at least one means among the comparators which compare with the output voltage of this triangular-wave generating means the difference voltage which a difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal and the voltage of this laser diode drive terminal, a triangular-wave generating means to output the triangular wave which makes internal-reference voltage Vref bias voltage, and changes up and down, and this difference voltage-output means detected.
[Claim 6] In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the laser diode current-output means and this laser diode current-output means of a current supply source being carried out through the 1st power terminal, and supplying the current proportional to the input signal to a laser diode through a laser diode drive terminal
The optical disk unit characterized by preparing the 1st voltage source which supplies the 1st supply voltage to this 1st power terminal, and the 2nd voltage source which supplies the 2nd supply voltage to these drive current control means.

[Claim 7] In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the laser diode current-output means and this laser diode current-output means of a current supply source being carried out through the 1st power terminal, and supplying the current proportional to the input signal to a laser diode through a laser diode drive terminal
The optical disk unit characterized by preparing the 1st power terminal which supplies the 1st supply voltage to this laser diode current-output means, and the 2nd power terminal which supplies the 2nd supply voltage to these drive current control means.
[Claim 8] In an optical disk unit according to claim 6
The optical disk unit characterized by output voltage supplying the output voltage of the voltage adjustable regulator means in which adjustable is possible to this 1st power terminal.
[Claim 9] In an optical disk unit according to claim 6
The optical disk unit characterized by establishing an output voltage setting means by which connect with this 1st power terminal and an output terminal sets up the output voltage of the voltage adjustable regulator means in which adjustable is possible as for output voltage, and this voltage adjustable regulator means.
[Claim 10] In an optical disk unit according to claim 6
The optical disk unit characterized by to form the controller which controls this voltage setting means so that an output terminal is connected to this 1st power terminal, output voltage incorporates the detection result of an output-voltage setting means set up the output voltage of the voltage adjustable regulator means in which adjustable is possible, and this voltage adjustable regulator means, a difference-voltage-detector means detect the difference voltage of the voltage of this 1st power terminal, and the voltage of this laser-diode drive terminal, and this difference-voltage-detector means and the aforementioned difference voltage serves as a predetermined value.
[Claim 11] In an optical disk unit according to claim 6
The optical disk unit characterized by establishing a difference voltage fixed-ized means to carry out adjustable [of the output voltage] and to supply this 1st power terminal so that difference voltage which a difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal and the voltage of this laser diode drive terminal, and this difference-voltage-detector means detected may be made into a control-input signal and difference voltage may be in agreement with internal-reference voltage.
[Claim 12] In an optical disk unit according to claim 7
The optical disk unit characterized by preparing at least one means in this optical disk unit among the comparators which compare with the output voltage of this triangular-wave generating means the difference voltage which a difference-voltage-detector means to detect the difference voltage of the voltage of this 1st power terminal and the voltage of this laser diode drive terminal, a triangular-wave generating means to output the triangular wave which makes internal-reference voltage Vref bias voltage, and changes up and down, and this difference voltage-output means detected.
[Claim 13] A drive wave generation means to generate a drive wave signal,
The 1st current-supply-source means which supplies drive current to the 1st laser diode,
The 2nd current-supply-source means which supplies drive current to the 2nd laser diode,
The optical disk unit characterized by having a change means to supply the output of the aforementioned drive wave generation means to either of the current-supply-source

means of the above 1st, and the current-supply-source means of the above 2nd.
[Claim 14] In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode current-output means of a current supply source being carried out through the 1st power terminal, and supplying the current proportional to the input signal to the 1st laser diode through the 1st laser diode drive terminal
Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 2nd laser diode drive terminal is minded. The supply place of the output signal of the 2nd laser diode current-output means and these drive current control means supplied to the 2nd laser diode to the laser diode change means and this 1st power terminal which are changed to the 1st or 2nd laser diode current-output means the 1st supply voltage The optical disk unit characterized by preparing the 1st voltage source to supply and the 2nd voltage source which supplies the 2nd supply voltage to these drive current control means.
[Claim 15] In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode current-output means of a current supply source being carried out through the 1st power terminal, and supplying the current proportional to the input signal to the 1st laser diode through the 1st laser diode drive terminal
Carry out the current supply source of the current proportional to the input signal through the 1st power terminal, and the 2nd laser diode drive terminal is minded. The supply place of the output signal of the 2nd laser diode current-output means and these drive current control means supplied to the 2nd laser diode for the laser diode change means and this LD current-output means which are changed to the 1st or 2nd laser diode current-output means the 1st supply voltage The optical disk unit characterized by preparing the 1st power terminal to supply and the 2nd power terminal which supplies the 2nd supply voltage to these drive current control means.
[Claim 16] Set to an optical disk unit according to claim 14.
the voltage of this 1st power terminal -- this -- the difference voltage of the voltage of the 1st laser diode drive terminal, and the voltage of this 1st power terminal -- this -- the difference voltage of the voltage of the 2nd laser diode drive terminal -- detecting -- either -- a minimum difference-voltage-detector means to output the smaller one -- The optical disk unit characterized by establishing a difference voltage fixed-ized means to carry out adjustable [of the output voltage] and to supply this 1st power terminal so that difference voltage which this minimum difference-voltage-detector means detected may be made into a control-input signal and difference voltage may be in agreement with internal-reference voltage.
[Claim 17] In an optical disk unit according to claim 15
the voltage of this 1st power terminal -- this -- the difference voltage of the voltage of the 1st laser diode drive terminal, and the voltage of this 1st power terminal -- this -- the difference voltage detector of the voltage of the 2nd laser diode drive terminal -- carrying out -- either -- a minimum difference-voltage-detector means to output the smaller one -- The optical disk unit characterized by establishing at least one means among the comparators which compare with the output voltage of this triangular-wave generating means the difference voltage which a triangular-wave generating means to output the triangular wave which makes internal-reference voltage Vref bias voltage, and changes

up and down, and this minimum difference voltage-output means detected.
[Claim 18] In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode current-output means of a current supply source being carried out through the 1st power terminal, and supplying the current proportional to the input signal to the 1st laser diode through the 1st laser diode drive terminal
Carry out the current supply source of the current proportional to the input signal through the 3rd power terminal, and the 2nd laser diode drive terminal is minded. The supply place of the output signal of the 2nd laser diode current-output means and these drive current control means supplied to the 2nd laser diode to the laser diode change means and this 1st power terminal which are changed to the 1st or 2nd laser diode current-output means the 1st supply voltage The optical disk unit characterized by preparing the 1st voltage source to supply, the 3rd voltage source which supplies the 3rd supply voltage to this 2nd power terminal, and the 2nd voltage source which supplies the 2nd supply voltage to these drive current control means.
[Claim 19] In the optical disk unit which has the drive current control means which generate the signal wave form inputted into the 1st laser diode current-output means and this laser diode current-output means of a current supply source being carried out through the 1st power terminal, and supplying the current proportional to the input signal to the 1st laser diode through the 1st laser diode drive terminal
Carry out the current supply source of the current proportional to the input signal through the 3rd power terminal, and the 2nd laser diode drive terminal is minded. To the 2nd laser diode the laser diode change means which changes the supply place of the output signal of the 2nd laser diode current-output means and these drive current control means to supply to the 1st or 2nd laser diode current-output means -- this -- the 1st supply voltage for the 1st laser diode current-output means the 1st power terminal to supply -- this -- the optical disk unit characterized by preparing the 3rd power terminal which supplies the 3rd supply voltage to the 2nd laser diode current-output means, and the 2nd power terminal which supplies the 2nd supply voltage to these drive current control means
[Claim 20] It is an optical disk unit given in a claim 6 or any 1 term of 18.
The optical disk unit characterized by having communalized this 1st voltage source and this 2nd voltage source, and considering as the 2nd one voltage source.
[Claim 21] The laser diode drive method characterized by making adjustable voltage for generating the drive wave signal of the aforementioned laser diode, and generating the aforementioned drive current in the laser diode drive method of driving a laser diode in case the drive current proportional to the aforementioned drive wave signal is supplied to the aforementioned laser diode.
[Claim 22] In the laser diode drive method of driving a laser diode The laser diode drive method characterized by generating the drive wave signal of the aforementioned laser diode, detecting difference voltage with the voltage for generating the forward voltage and the aforementioned drive current of a laser diode in case the drive current proportional to the aforementioned drive wave signal is supplied to the aforementioned laser diode, and making it the aforementioned difference voltage serve as a predetermined value.
[Claim 23] In the laser diode drive method of driving a laser diode The drive wave signal of the aforementioned laser diode is generated. In case the drive current proportional to

the aforementioned drive wave signal is supplied to the aforementioned laser diode Difference voltage with the voltage for generating the forward voltage and the aforementioned drive current of a laser diode is detected. The laser diode drive method characterized by making it the aforementioned difference voltage serve as a predetermined value by generating the triangular wave which makes internal-reference voltage Vref bias voltage, and changes up and down, and comparing the aforementioned difference voltage with the aforementioned triangular wave.

[Claim 24] the laser diode drive method characterized by supplying the drive current which generated the drive wave signal which drives the aforementioned laser diode in the laser diode drive method of driving the 1st laser diode and 2nd laser diode, boiled the aforementioned drive wave signal, and was proportional to either of the 1st laser diode of the above, and the 2nd laser diode of the above

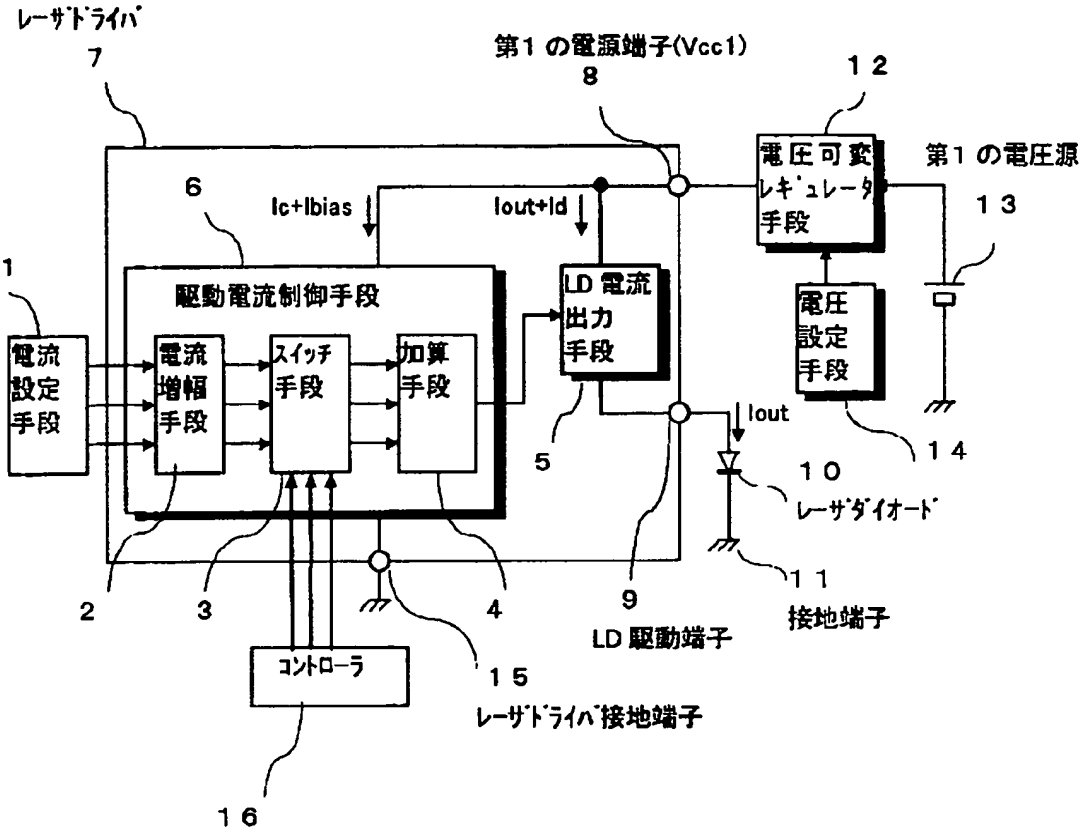
[Claim 25] The laser-diode drive method which carries out [generating the drive wave signal which drives the aforementioned laser diode in the laser-diode drive method of driving the 1st laser diode and 2nd laser diode, detecting difference voltage with the voltage for generating the forward voltage and the aforementioned drive current of a laser diode, in case the drive current proportional to the aforementioned drive wave signal is supplied to the aforementioned laser diode, and making it the aforementioned difference voltage serve as a predetermined value, and] as the feature.

[Claim 26] In the laser diode drive method of driving the 1st laser diode and 2nd laser diode The drive wave signal of the aforementioned laser diode is generated. In case the drive current proportional to the aforementioned drive wave signal is supplied to the aforementioned laser diode Difference voltage with the voltage for generating the forward voltage and the aforementioned drive current of a laser diode is detected. The laser diode drive method characterized by making it the aforementioned difference voltage serve as a predetermined value by generating the triangular wave which makes internal-reference voltage Vref bias voltage, and changes up and down, and comparing the aforementioned difference voltage with the aforementioned triangular wave.

[Translation done.]

Drawing selection drawing 1

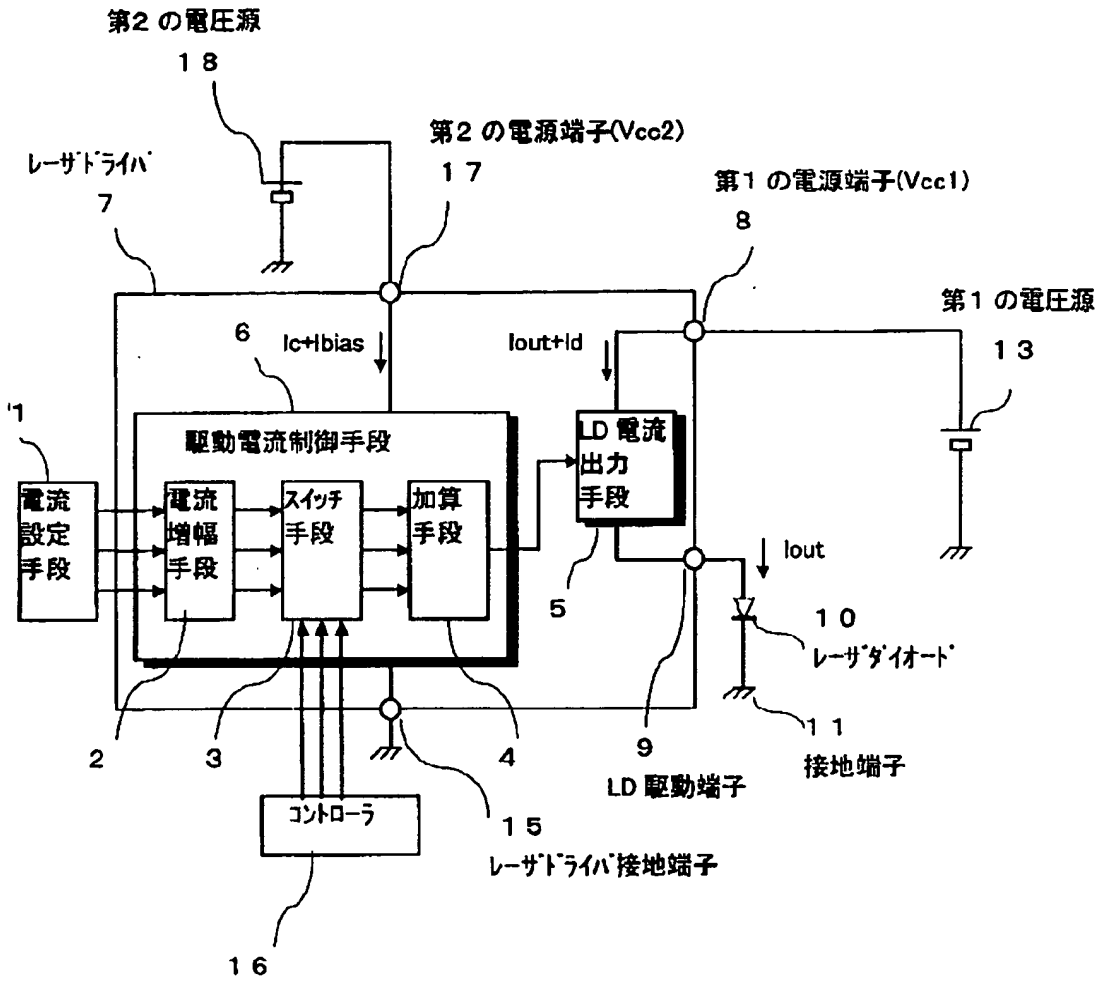
図 1



[Translation done.]

Drawing selection draw ing 2

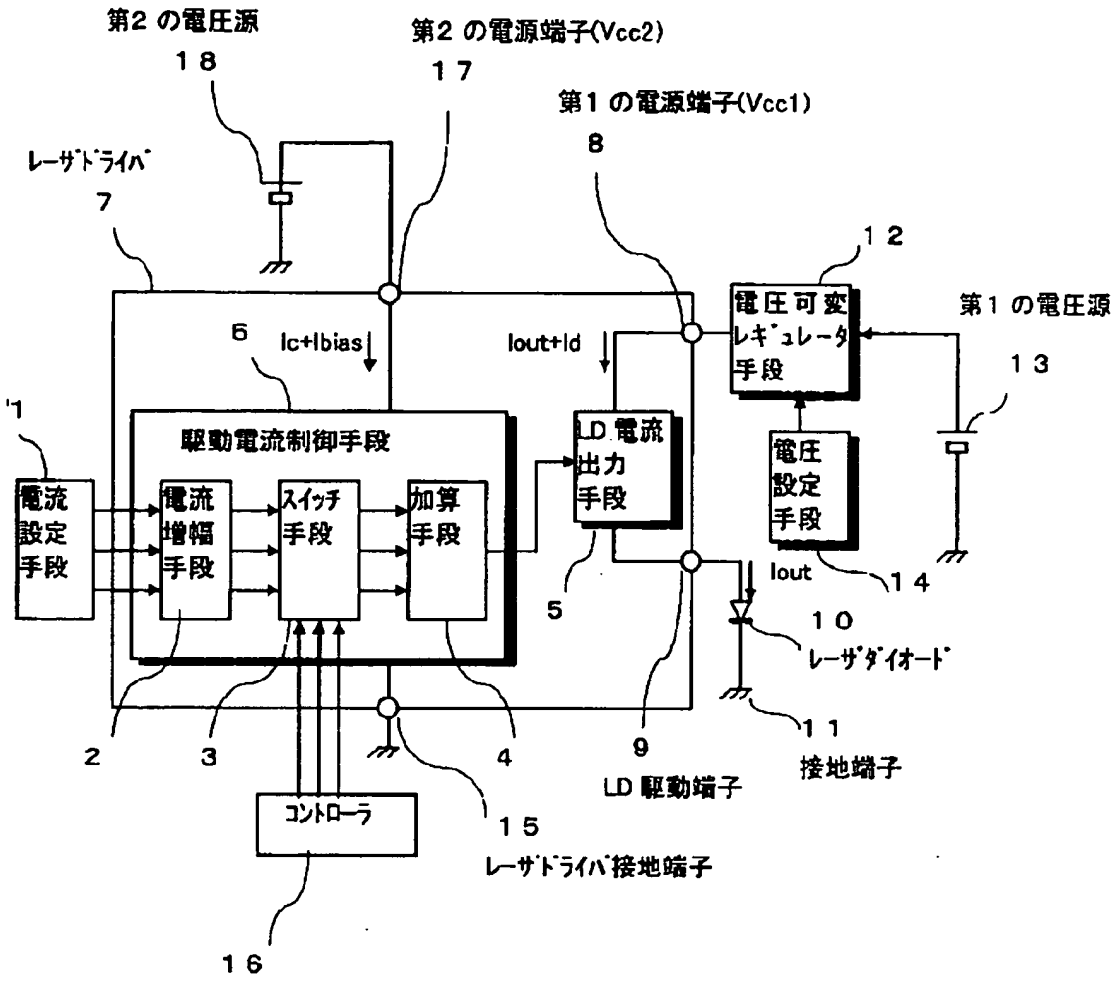
図 2



[Translation done.]

Drawing selection [draw ing 3]

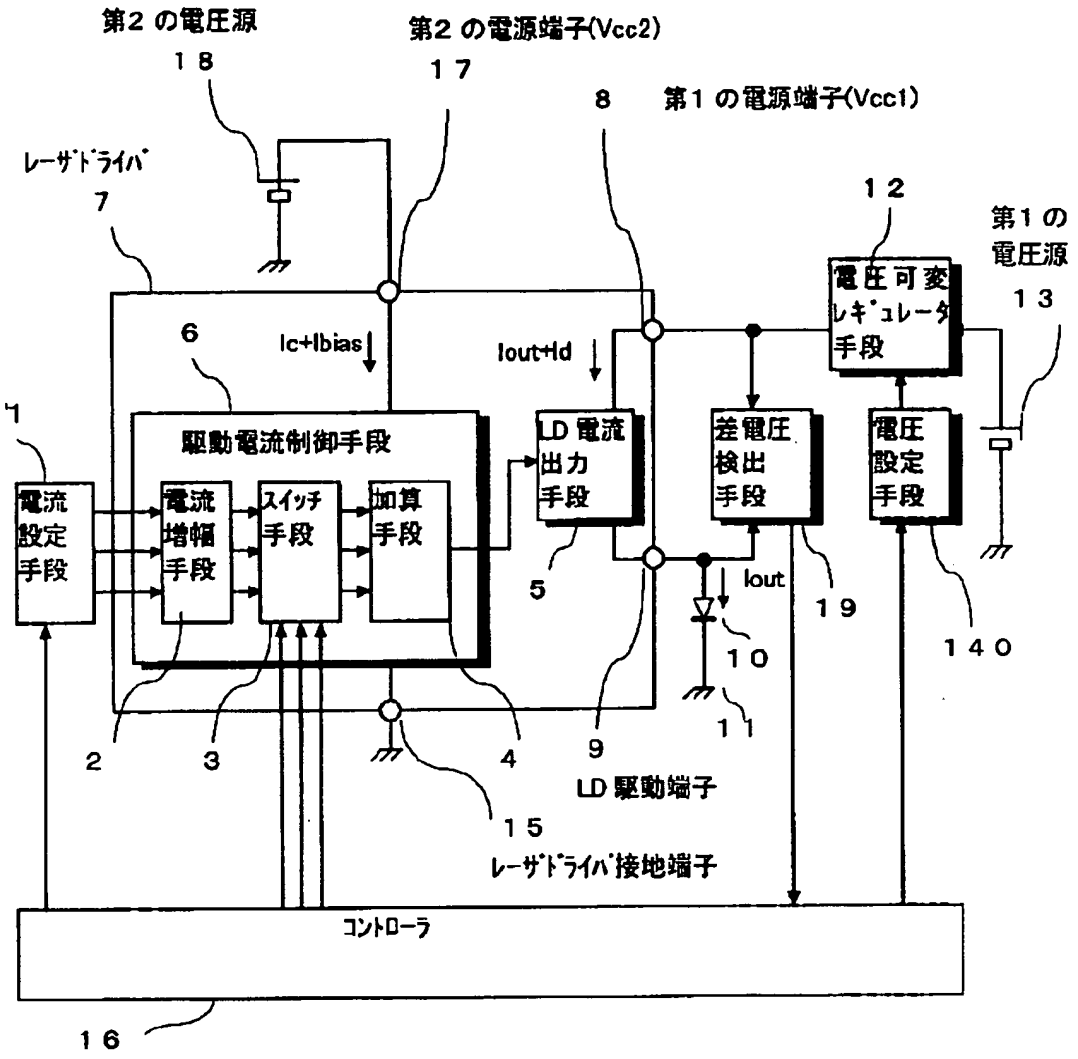
図 3



[Translation done.]

Drawing selection [draw ing 4]

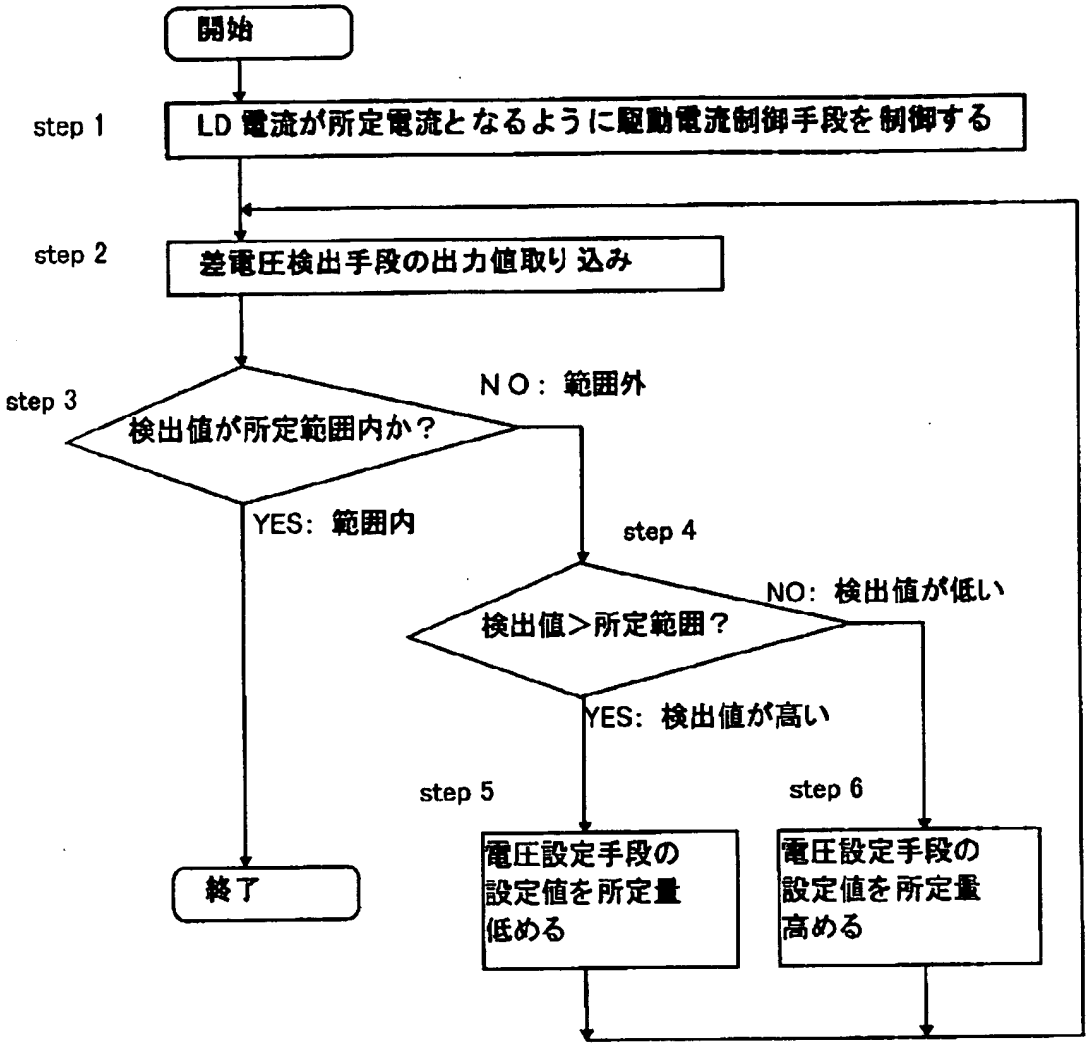
図 4



[Translation done.]

Drawing selection draw ing 5

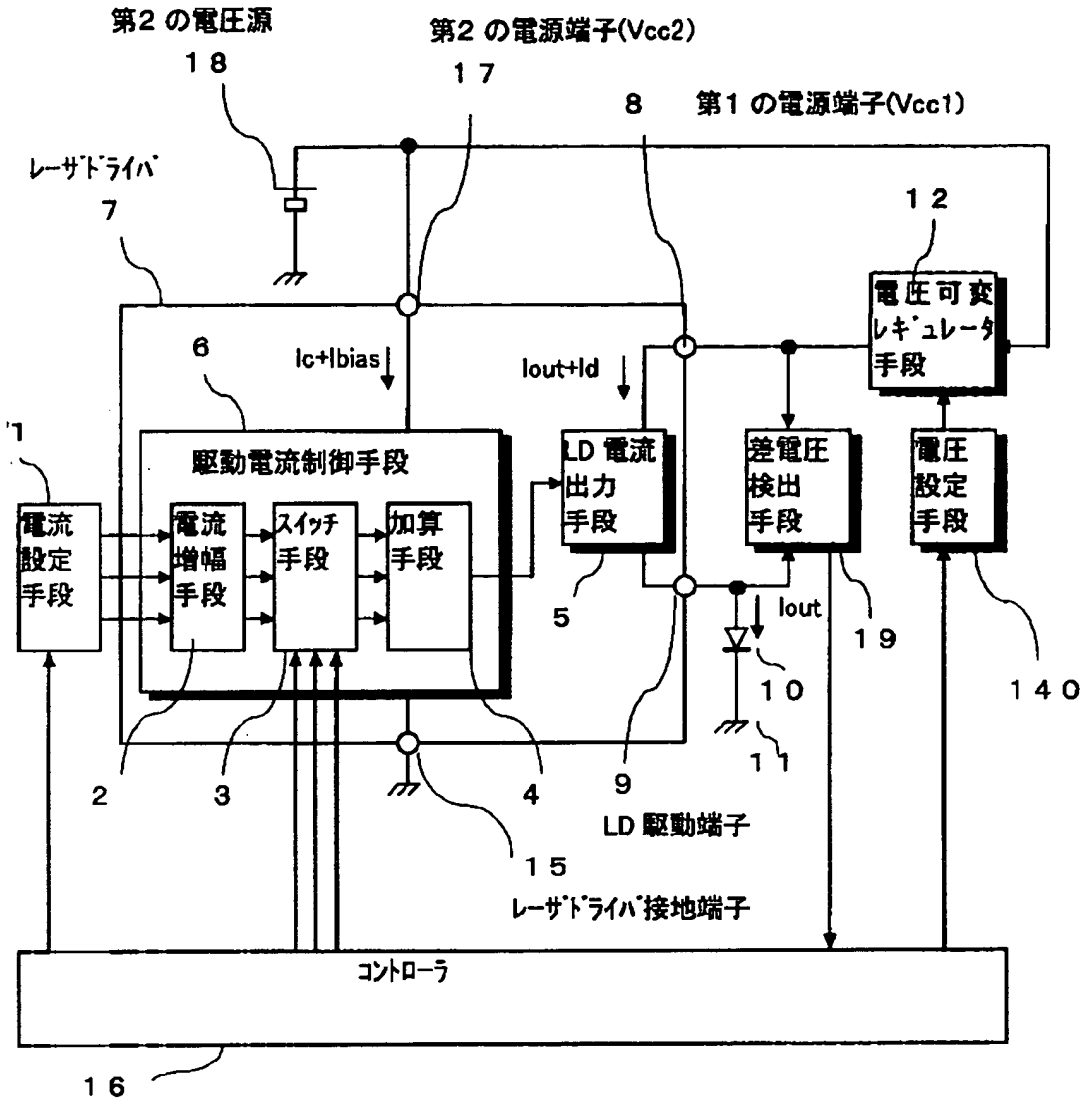
図 5



[Translation done.]

Drawing selection draw ing 7

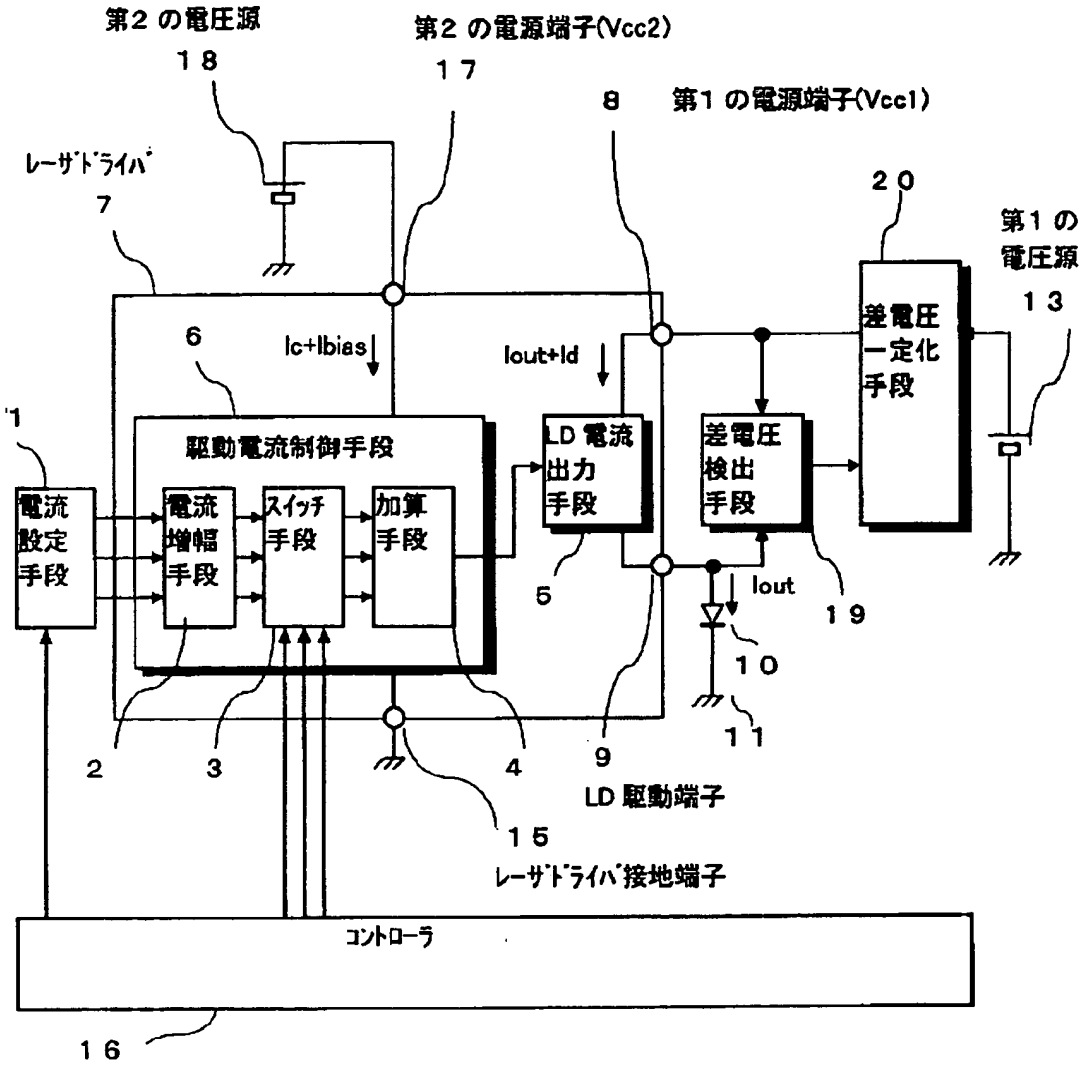
図 7



[Translation done.]

Drawing selection drawing 8

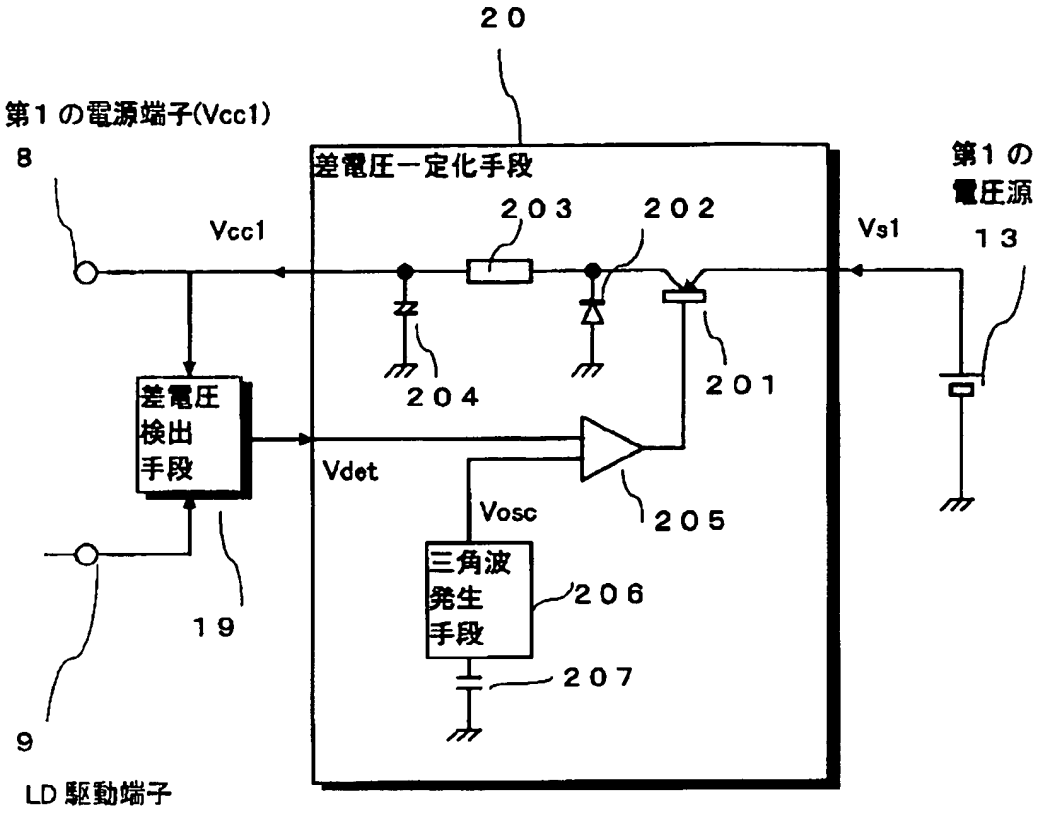
図 8



[Translation done.]

Drawing selection drawing 9

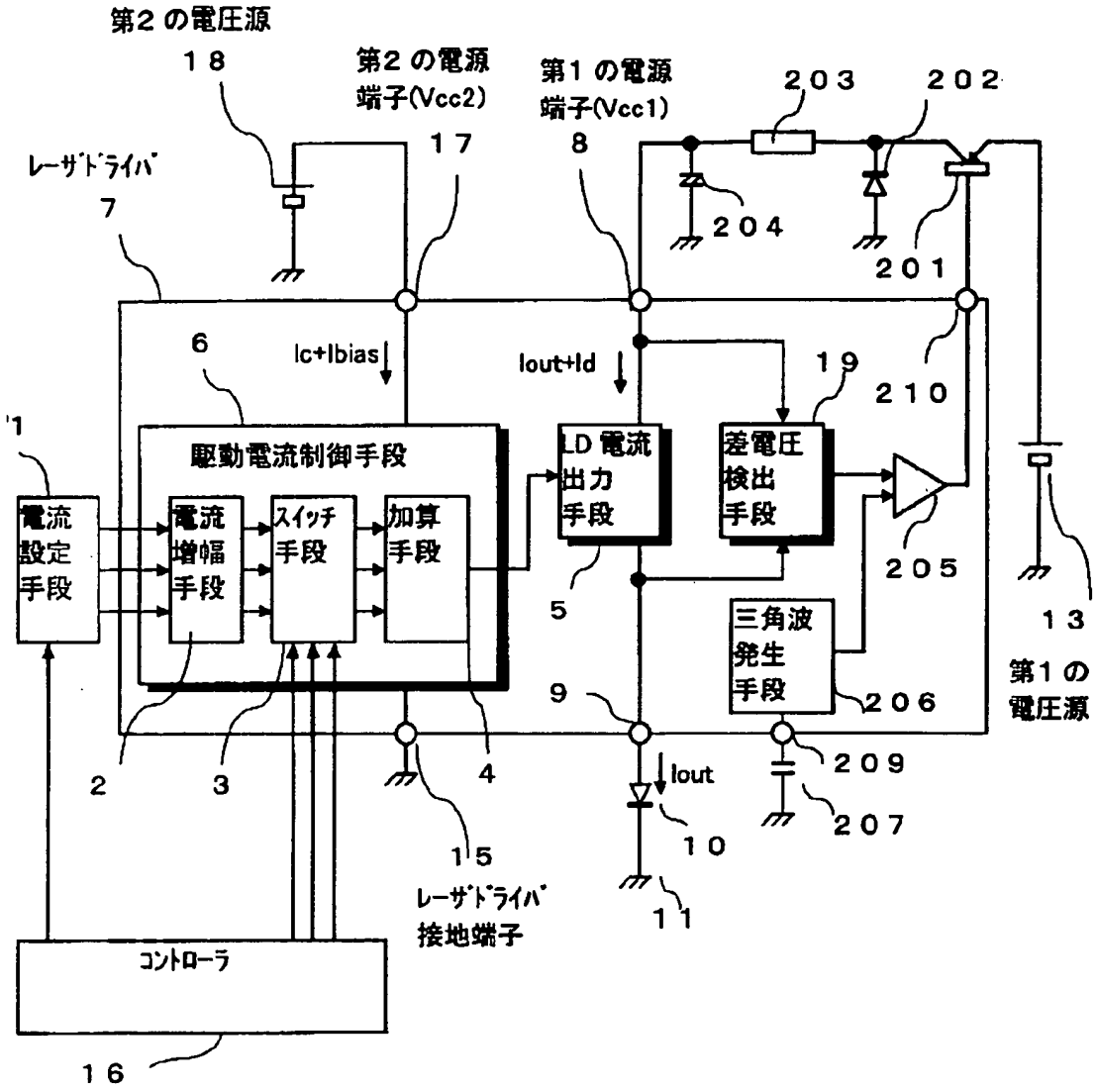
図 9



[Translation done.]

Drawing selection drawing 10

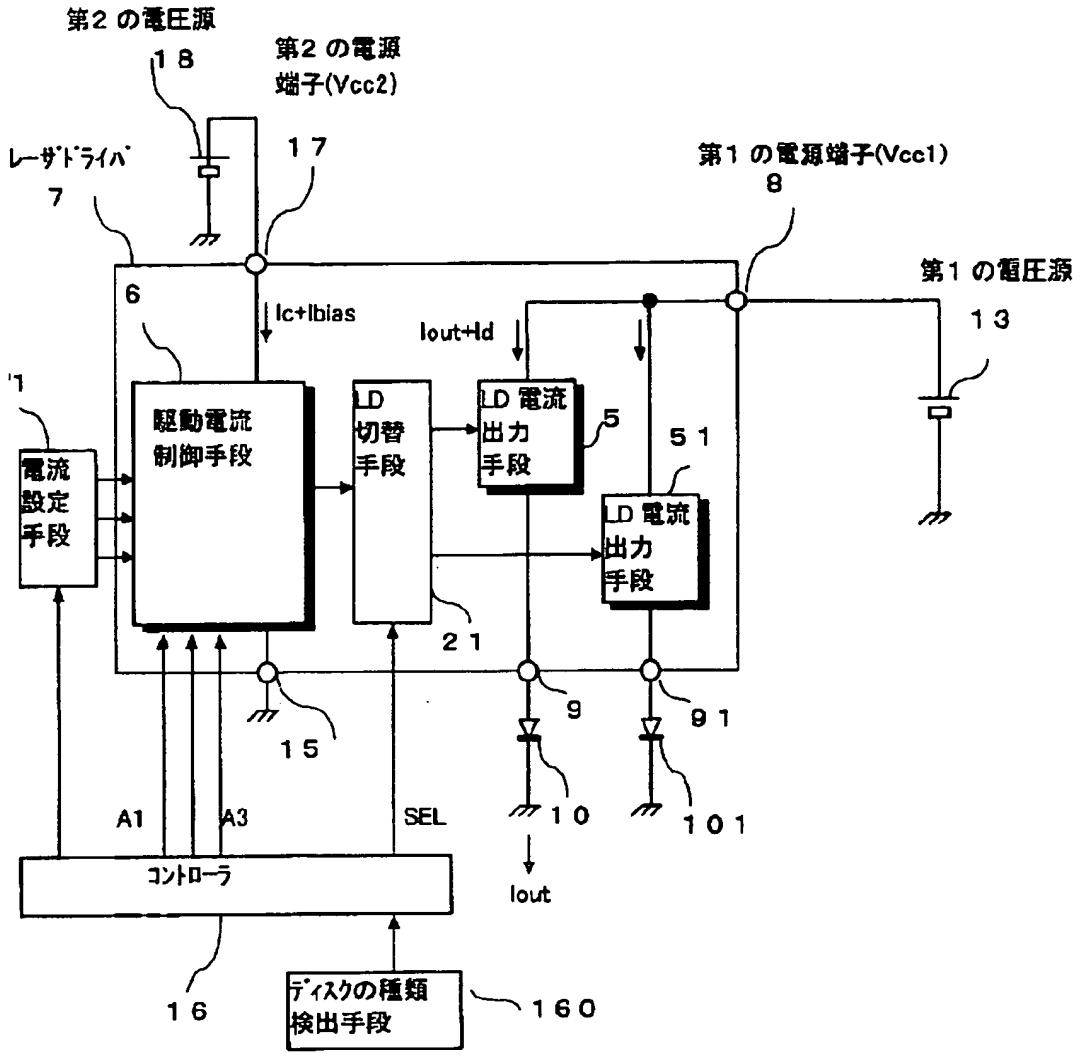
図１０



[Translation done.]

Drawing selection draw ing 11

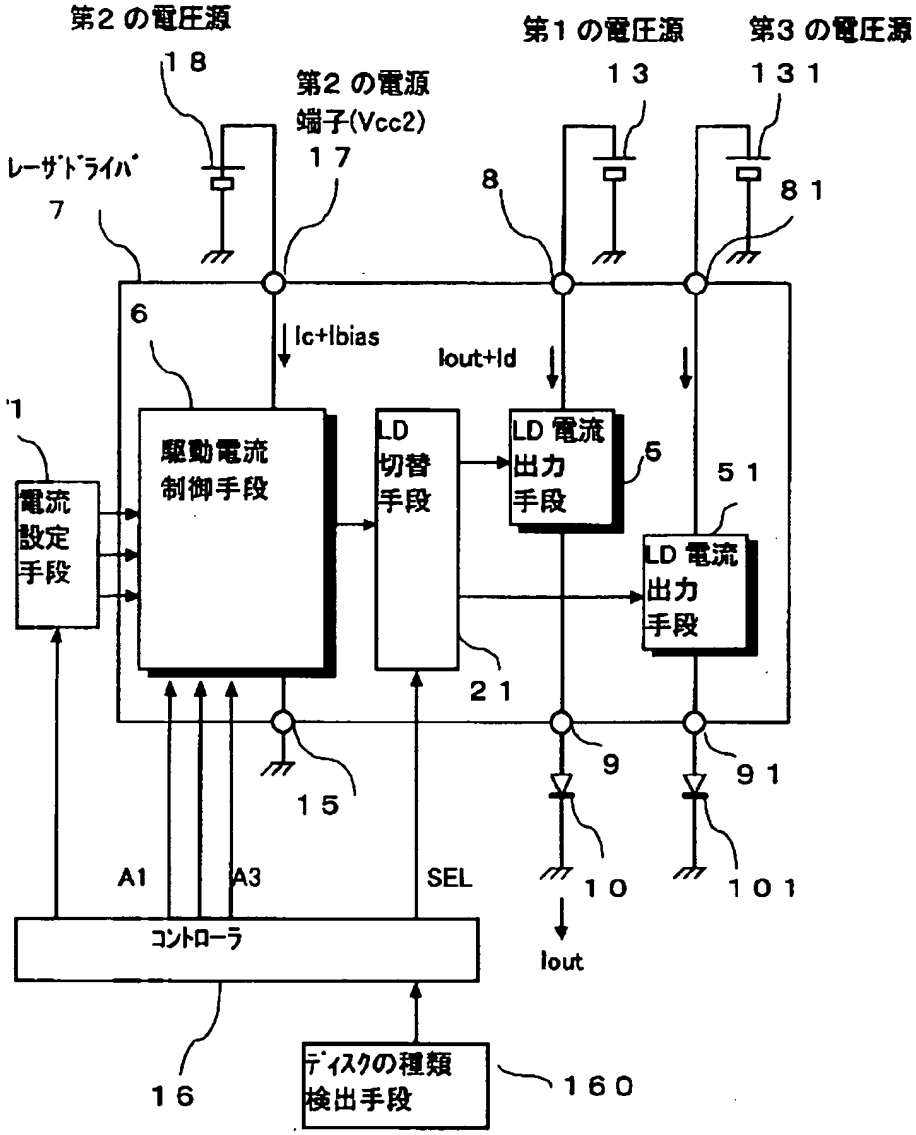
図 １１



[Translation done.]

Drawing selection draw ing 12

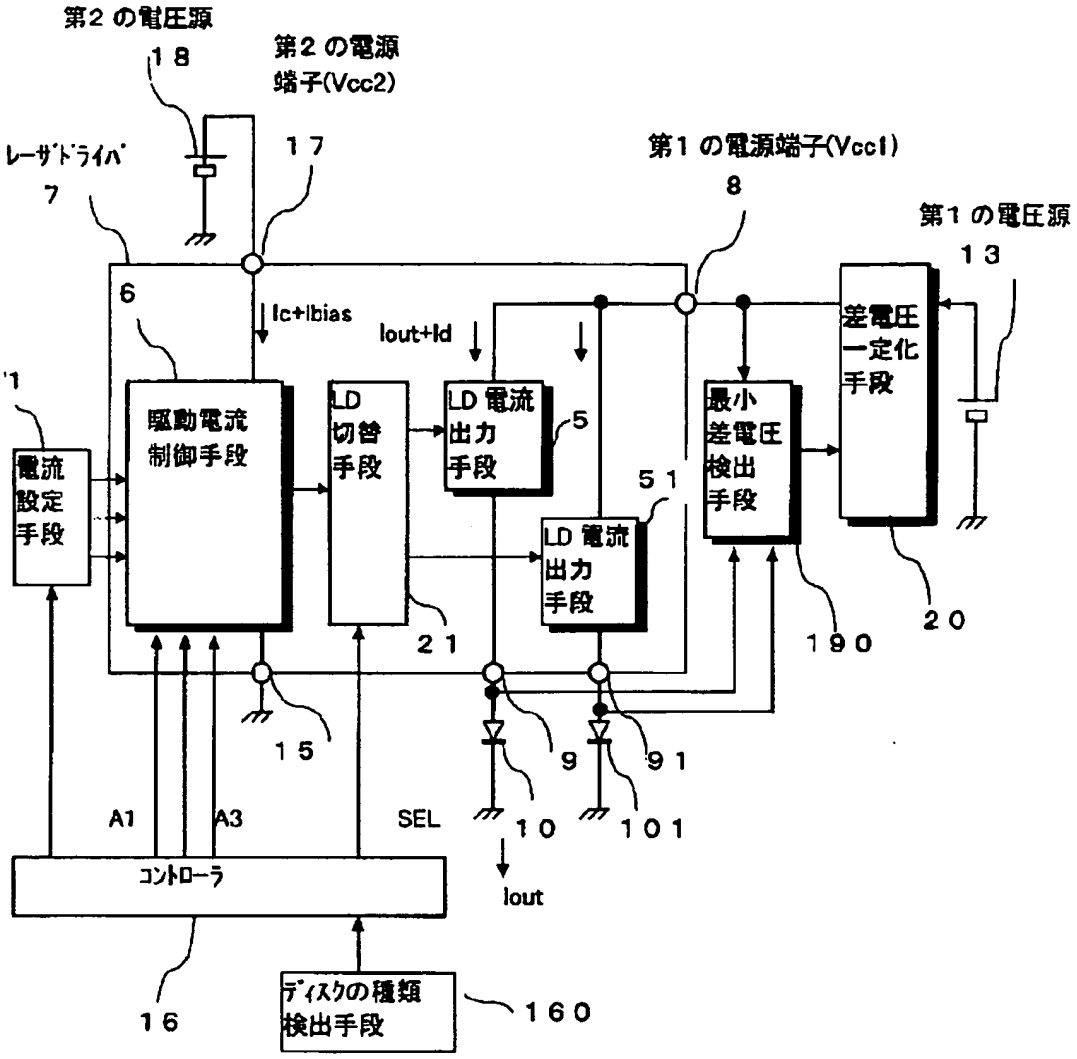
図 １２



[Translation done.]

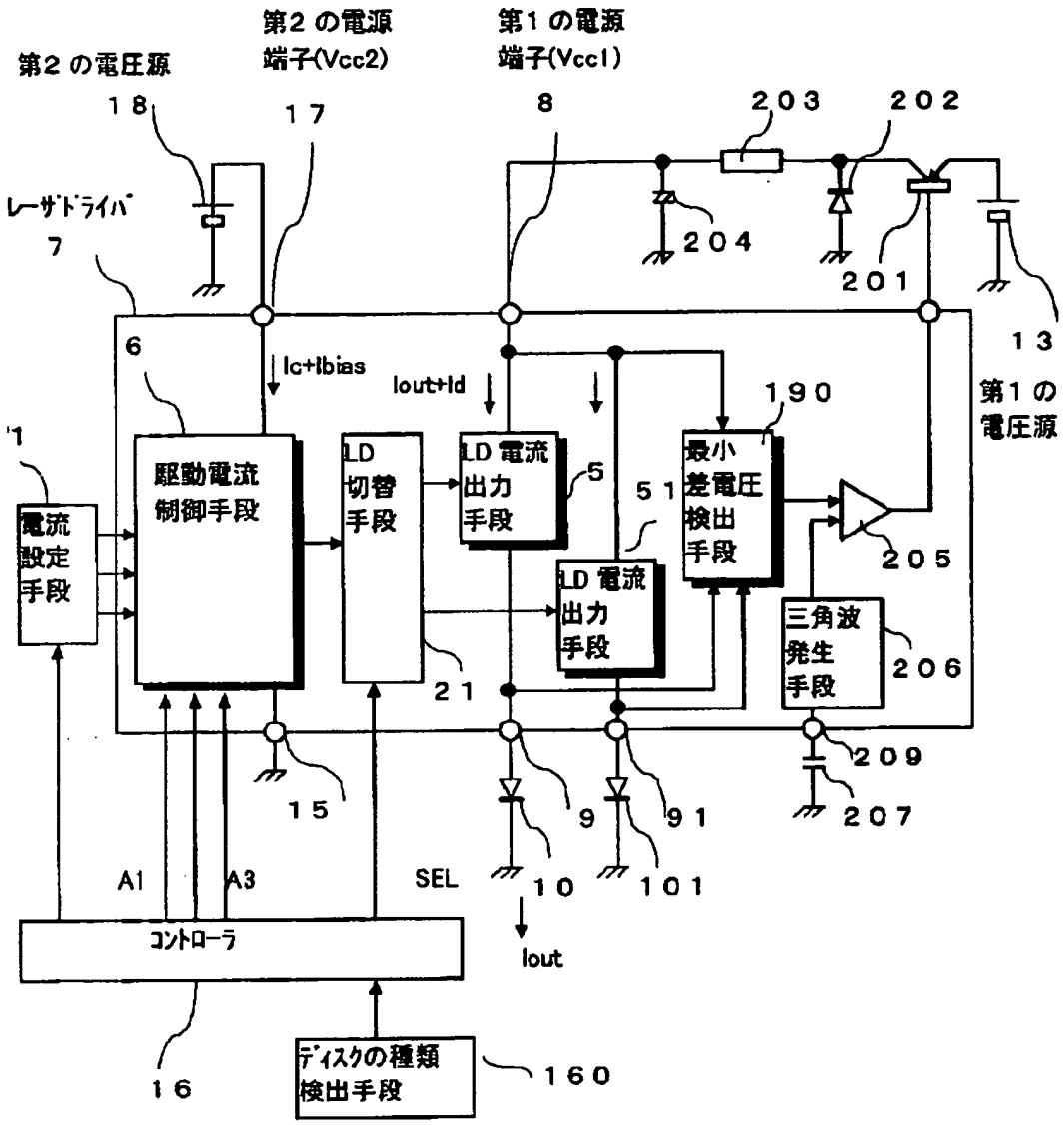
Drawing selection draw ing 13

図 １３



Drawing selection drawing 14

図 14



[Translation done.]